Amendments to the Specification:

Please replace paragraph starting on page 4, at line 4 with the following rewritten paragraph:

United States Patent 5,118,198 discloses a cement mixing apparatus with a cradle support assembly and including a polyethelyne cement mixing drum held and supported by a cradle arm assembly formed of cradle base support braces and upright cradle arms which interfit into cradle arm recesses which are preformed with the polyethylene drum. A bull gear drives the polyethylene drum. The drum disclosed in this patent is intended for light duty cement operations and does not address the structural and manufacturing requirements for heavy duty operations. United States patent 5,492,401 discloses a concrete mixer with a mixing drum consisting of high density crosslinked polyethylene material. The drum includes a bottom supported ~~buy~~ by a conventional rigid metal pan secured to the external surface thereof to rigidify the plastic drum and extend the life expectancy of the plastic drum by enabling the concrete mixer to be used to complete a mixing job at a job site even though movement of the concrete mix within the drum during repetitive mixing cycles may ultimately wear a hole through the bottom of the plastic drum. Paddle assemblies are positioned interiorly of the drum and oriented to maintain minimum splashing during the mixing operation. Not only is the drum disclosed in this patent unsuitable for heavy duty vehicle mounted operation the patent in fact teaches a means to accommodate a wear failure on site whereby a hole could be worn through the wall of the drum.

Please replace paragraph starting on page 8, line 11, with the following rewritten paragraph:

According to another broad form of the method aspect, the present invention comprises; a method of manufacture of a vehicle mounted plastics rotatable concrete mixing drum comprising the steps of;

a) taking a male mould part whose external surface defines an ~~external~~ internal profile of a concrete mixing drum;

b) applying a release agent to an outer surface of said mold part;

c) applying over said release agent an elastomer in liquid form and allowing said elastomer to polymerise against the mould so as to form a first layer of said drum;

d) applying a bonding agent to said elastomeric layer as a substrate coupling layer to receive an outer structural layer of filament;

e) winding said filament about said drum to form an outer structural matrix.

Please replace paragraph starting on line 5, page 10, the descriptions for Figure 3, Figure 4 and Figure 9, with the following rewritten paragraph:

The present invention will now be described according to a preferred but non limiting embodiment and with reference to the accompanying illustrations wherein:

Figure 1 shows a side elevation of a prior art mixing drum;

Figure 2 shows a side elevation of a cement mixing drum according to one embodiment of the invention;

Figure 3 shows three mould parts to be joined in making a drum ~~Figure 3 shows a cross section through the junction of two drum parts showing the join construction~~;

Figure 4 shows the mould sections of Figure 3 assembled onto a mandrel: ~~Figure 4 shows an enlarged view of the apex of the helical blade3;~~

Figures 5a-d show the first stages of preparation of the drum.

Figure 6 shows an enlarged profile section of a typical mixing blade.

Figures 7a-c shows an end elevation view of the mold clamping and inflation steps.

Figure 8 shows the mold and drum stored for demolding.

Figure 9 shows a drum inside a grit chamber in which a grit jet is traversed over the shell surface to prepare the surface so it is chemically receptive to the bonding of the next stage.

Please replace paragraph starting on page 11, line 20, with the following rewritten paragraph:

Figure 1 shows an elevation view of a known steel mixing drum 1 which is typically constructed from separate prefabricated sections 2, 3 and 4 which are welded together at seams 5, 6 and 7. At seams 5, 6 and 7 the welded joints which are subject to concentrated wear due to the change in surface direction at the ~~join~~ joint. The concentrated wear points in the prior art steel drums reduces the working life of the drums necessitating costly repair or

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replacement. Steel drums are fabricated from rolled flat sheets which form cones and a cylinder which are then joined together by welding. Archimedian spirals are then welded to the inner surface of the drum resulting in a high specific gravity vessel whose self weight reduces the amount of concrete which can be carried by the vehicle to which it is attached. As previously indicated, the steel drums suffer from a number of disadvantages including susceptibility to abrasion at the junctions of the cylindrical and conical sections and the tendency for unwanted concrete build up at the sharp corners and crevices formed by the mixing blades. In addition, the smooth internal surface of the steel drum promotes sliding abrasion and inhibits mixing at the boundary layer due to the low coefficient of friction at the concrete/metal interface.

Please replace paragraph starting on page 12, line 12, with the following rewritten paragraph:

Figure 2 shows an external profile of a fibre reinforced composite concrete mixing drum 8 according to one embodiment of the invention. The drum includes an internal archimedian spiral formed by helical blades or vanes which mix concrete during rotation of the drum in one direction and discharge concrete when the drum is rotated in an opposite direction. The drum is generally pear shaped and includes an opening 9 at one end for entry and discharge of concrete. The arrangement of figure 2 is arrived at by application of the method aspect of the invention which will be described in detail below. Drum 8 is constructed from a fibre reinforced plastic structural shell with an elastomeric interior having a surface property which imparts abrasion resistance to the concrete but increases the mixing at the boundary layer of the concrete and drum wall by forced rotation of aggregate. A preferred method of construction of the drum will now be described in detail. Whilst the embodiment described employs three mould parts it will be appreciated that the drum may be constructed from a lesser or greater number of parts. It has been found however, that a three part construction is preferable in view of the shape of the finished drum. ~~According to the preferred embodiment, drum 8 is constructed from three moulded parts 10, 11 and 12 according to the following methodology. Figure 3 shows typical profiles of mold parts 13, 14 and 15 wherein part 13 is constructed to engage a drive system mounted on a vehicle for rotating said drum, part 14 is an intermediate section which engages parts 13 and 15. Part 15~~

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~~includes a discharge opening through which mixed concrete is discharged.~~ According to one embodiment, drum 8 is constructed from three mold sections 13, 14 and 15 (shown in Figure 3) which form portions 12, 11 and 10, respectively, of drum 8. Figure 3 shows typical profiles of mold sections 13, 14 and 15. Portion 12 of drum 8 is constructed to engage a drive system mounted on a vehicle for rotating the drum. Portion 11 extends between portions 12 and 10. Portion 10 includes a discharge opening through which mixed concrete is discharged. The first step in the construction of the mixing drum is the preparation of the mold from which the drum will be produced. The mold is preferably constructed in three parts as this enables ease of extraction form mold formers and also allows for the formation of mixing drums of different sizes according to requirements. For instance the length of the drums can be increased by changing the size of intermediate section 14. Mold sections 13, 14 and 15 are each formed in separate molds from expanded polystyrene beads. Steam heat is applied through slots in each mold thereby fusing the beads against the mold surface. The polystyrene surface finish of the mold may be improved by the application of a fast drying liquid. The external profile of the mould parts when joined provide the mold for the inner surface of the drum. The mold profile includes helical grooves which are the inverse of helical mixing blades which extend from an inner surface of the finished drum. The mould and partially finished drum are shown at 16.

Please replace paragraph starting on page 14, at line 20, with the following rewritten paragraph:

Prior to application of the fibre reinforced layer, a rope formed of multiple glass fibre strands is delivered from a dispensing creel into the grooves of the spiral helix. This part of the operation is represented by figure 5d. The rope is drawn through a bath of resin and is lead through a guide eye to fall into the blade groove. Tensioning of the rope pulls it into the groove. When the ~~repor~~ rope hardens it becomes a high strength reinforcing bar along the full length of the helical spiral. The polyurethane which is sprayed onto the mold by this stage generally conforms to shape of the mold except for bridging that is required between the groove walls. In the example of Figure 6, there is shown an enlarged profile section of a typical mixing blade 24. Each blade comprises an elastomeric layer 20 which forms the inner surface of the drum. A coupling layer 21 is applied over the elastomeric layer following

which a structural layer 22 is applied inside the concave recess 23. This process is completed for each section of spiral at a join whereupon, a further coupling layer 25 is applied to the remainder of the outer surface of the drum over which is applied a structural layer 26 which is preferably a fibre reinforced composite to form a structural shell. Included deep inside recess 23 is a continuous filament and resin rope 35.

Please replace paragraph starting on page 15, at line 11, with the following rewritten paragraph:

A rigid shell is required to bridge across the helical groove and this is provided by sprayed composite resin and chopped glass strands completing the structural layer 26. The sprayed resin is hand rolled followed by clamping then inflation of the mold before the polyurethane has gelled. Figures 7a-c show an end elevation view of the mold clamping and inflation steps. Figure 7a shows the clamping assembly 30 in the open configuration. Mold and partially completed plastics drum is represented by broken line 31. Before the composite of resin and chopped glass strands has gelled the mold is located on clamp assembly 30 whereupon arms ~~32 and 33~~ are closed over the composite. As shown in figure 5c. After clamping, the mold is inflated to ensure complete contact with the fibre reinforced composite layer. The mold and drum 31 are stored for four hours until the resin is sufficiently cured for the next stage. Figure 8 shows the mold and drum 31 stored for demolding. Figure 9 shows drum 31 inside grit chamber 32 in which a grit jet is traversed over the shell surface to prepare a surface which is chemically receptive to the bonding of the next stage. The next step involves filament winding of a fibre reinforced structural layer. A winding arrangement as shown in figure 10 is arranged to wind resin wetted fibre rovings around a rotating former. The tensile strength of the windings which may be in the order of 600 ~~MPa~~ Mpa. Figure 10 shows drum 31 mounted for rotation on a computer controlled winding machine to enable winding of glass rovings 34. To obtain the optimum physical properties of the filament wound structure the fibres are aligned to the loads imposed in use of the finished drum. Typical loadings on the drum are axial bending under weight of wet concrete, an applied dynamic load at the drive end of the drum, driving torque and support loads at the discharge trunion rolls. The winding pattern of the filaments aligns the fibres at 10 degrees at mid span

to withstand bending stresses increasing in angle and in wall thickness towards the discharge end to accommodate applied roller loads.

Please replace paragraph starting on page 16, at line 12, with the following rewritten paragraph:

According to one embodiment the winding machine has three motor drives which rotate mandrel 17, move carriage parallel to the mandrel axis and a third motion at right angle to this. The rovings which line the drum are drawn through the resin bath and applied to the surface of the drum as a wide ribbon comprising thousands of tensioned fibres. The composite is applied by winding filament about the drum over the coupling layer 25 to form a fibreglass matrix with high strength properties sufficient to withstand normal operating loads applied during mixing and transporting concrete. The windings overlap until the required thickness is reached. The surface of the drum is covered with wet resin and small irregularities which need to be addressed to provide the external finish. As a result of this construction, the spiral mixing blades inside the drum are hollow with high bending and shear resistance during mixing operations. The inner elastomeric surface is highly resistant to abrasion by concrete yet it is softer and lighter than the steel equivalent. The higher resistance to abrasion is facilitated by the natural elastic deformation of the elastomer which absorbs the kinetic energy of the concrete particles without gouging of the surface material. In addition, due to the property of the inner surface which will preferably be polyurethane, the concrete will be mixed rather than slide at the boundary layer ensuring efficient mixing of the concrete throughout the mix and reduction of abrasion due to the smooth curves throughout the interior of the drum. In a further step, the structural layer is finished with a smooth pigmented resin which is applied utilising a clamp similar to that used for completion of the resin layer. Figures 11a and b show a two step process for application of a gel coat. Shell 40 is larger than shell 30 to accommodate the additional layer of the windings. As shown in figure 12 drum 31 is adapted with a stiffening ring 43 which distributes loads from trunion rollers incorporated on the vehicle on which the drum is to be mounted. This stage allows application of a corporate livery or alternative indicia into the structure of the finished drum. To achieve this shell parts 41 and 42 are printed with a selected livery and sprayed with a background gel coat. After gelation a light layer of reinforced composite is applied and

allowed to set. The shells re prepared in advance of the operation of application of the fibreglass windings while the resin is still liquid whereupon the shells are clamped around the windings thereby extruding out any excess resin. The shell mold assembly is mounted vertically and a two part compound is injected into the track ring mold space. Figures 13a --c shows the orientation of the drum 31 during this step. Once the resin has gelled, the shell molds are removed and the dischage end overwind is trimmed and a polyurethane drip flange is bonded at the discharge end. The final step involves removal of the mold remaining inside the drum followed by closure of the mandrel hole and cosmetic finishing. The mandrel is removed and the hole fitted with a pipe connection. The drum is stood vertically and acetone which dissolves the polystyrene is pumped into and out of the interior which is then cleaned and washed. The drum is then finished by removal of any resin flash. Figure 14 shows a cross section of an end region of a drum 50 including between spiral section 51 and wall 52 a baffle 53 imparting rigidity to the drum. The baffle plate is preferably glued into position. Figure 15 shows a cross section of a typical interface between a concrete mix 54 and a steel wall 55. Due to the inherent smoothness of the steel surface 56 the concrete tends to slide and abrade rather than mix. Figure 16 shows a cross section of a typical interface between a concrete mix 57 and an elastomeric boundary layer 58. As shown by arrows 59 the aggregate in the mix rotates due to the friction between concrete 57 and surface 58. The rotation avoids excessive abrasion of the surface 58 and enhances concrete mixing. Furthermore, as surface 58 is able to deflect, energy is dissipated by the inherent elasticity of the surface contributing to the reduction in wear. According to the preferred embodiment, the spiral blades inside the drum range varying between 0.5 and 2 metre pitch. At the drive end of the drum the spirals are approximately 2 metre pitch. The blades are reinforced by chopped strand, woven cloth or filament winding. The moulds may allow for a variety of helix pitches of the blades. Preferably, the radius of the root of the blade is greater than 10mm to avoid unwanted accumulation of set concrete. Furthermore, the blades are strengthened by their molding integrally with the wall of the drum and have a stiffness factor which will sustain all applied normal operating loads. In an alternative embodiment, the internal blades may be detachably fixed to the wall of the drum.

Please replace paragraph starting on page 18, at line 19, with the following rewritten paragraph:

An alternative method for construction of a fibre reinforced drum is shown in Figures 17a-o. Figure 17a shows a profiles of half mold part 60 which is coupled with a corresponding half to form completed mold 61. The first step in the construction of the mixing drum is the preparation of the mold from which the drum will be produced. The size of the drum may be changed by changing the dimensions of the mold. Mold section<u>s</u> are each formed from separate molds from expanded polystyrene beads. Steam heat is applied through slots in each mold thereby fusing the beads against the mold surface. The external profile of the mould parts when joined provide the mold for the inner surface of the drum. The mold profile includes helical grooves which are the inverse of helical mixing blades which extend from an inner surface of the finished drum.

Please replace paragraph starting on page 20, at line 16, with the following rewritten paragraph:

According to one embodiment one or more of any additional layers may be differentially coloured with to provide wear indicators. A white pigment in the surface layer may be provided for cleaning and inspection after use. The polyurethane is allowed to gel following which a chemical layer is sprayed onto the polyurethane surface as represented by figure 17g to ensure bonding with the next fibre reinforced composite layer. A coupling layer is applied to the remainder of the outer surface of the drum over which is applied a structural layer which is preferably a fibre reinforced composite to form a structural shell. A rigid shell is required and this is provided by sprayed composite resin and chopped glass strands completing the structural layer. The sprayed resin is hand rolled followed by clamping as shown in figures 17 i, j and k. Figures 17j and k show the clamping assembly 80 in the open and closed configurations respectively. Mold and partially completed plastics drum ~~68~~ <u>81</u> is shown in figure 17j. Before the composite of resin and chopped glass strands has gelled the mold is located on clamp assembly 80 whereupon arms 82 and 83 are closed over the composite layer. After clamping, the mold may be inflated to ensure complete contact with the fibre reinforced composite layer. The mold 61 and drum 81 are stored for four hours until the resin is sufficiently cured for the next stage.

Please replace paragraph starting on page 21, at line 19, with the following rewritten paragraph:

The methods, however differ firstly in relation to the method of construction of the helical blade. Figures 19a-e show a mold 90 mounted on mandrel <u>91</u> in the usual manner. Blade reinforcement operation represented by Figure 19 e is shown in more detail in Figures 20a-f.

Please replace paragraph starting on page 21, at line 22, with the following rewritten paragraph:

A spray head (not shown) follows the contour of the helical grooves 99 about the mold 90 and deposits a uniform bed polyurethane 101 against contoured base 102 at the bottom of groove ~~103~~ <u>100</u>. As illustrated in figure 20a, bed 101 is trowelled prior to setting with a profiled trowel head 103 and this forms a molded recess 104 into which is laid continuous glass fibre reinforced elastomer 105 as shown in figure 20b. Bed 101 will form the helical blade tip and this will be strengthened by the glass fibre elastomer 105 along the length of the helical blade. The reinforcing elastomer 105 is prior to installation placed in a resin matrix under tension. Figure 20c shows inserted in groove 100 a polyurethane insert 106 which leaves a space between the insert and wall 107. The resulting space defines the final profile shape of a solid core blade. As shown in figure 20d, spacer blocks ~~107~~ <u>111</u> are applied to the surface ~~107~~ <u>112</u> of mold 90 over which is placed an external mold 108 as shown in figure 20e. The spacer blocks are preferably made of polyurethane which is the same material to be injected onto the cavity formed by the insert mold 106 and external mold <u>shell</u> 108. This arrangement corresponds to the steps illustrated by figures 19f-h. The mold 90 is preferably disposed vertically for injection molding of the inner layer of the drum. Figure 19g shows mold shell 108 in an open configuration and figure 19 h shows mold shell 108 closed for injection molding of polyurethane elastomer 109. Injection of cold setting polyurethane resin into the mold cavity bonds to the extruded elastomer and the matrix of the tensile member and forms the rest of the blade and the elastomer interior of the concrete mixer. Figure 19i shows partially completed drum 120 inside grit chamber 121 in which a grit jet is traversed over the shell surface to prepare a surface which is chemically receptive to the bonding of the next stage. The next step involves filament winding of a fibre reinforced

structural layer. A winding arrangement as shown in figure 19j is arranged to wind resin wetted fibre rovings 122 around a rotating former. While the resin is still wet, the gel coated external mold 123 is closed over the structural shell to form the external surface of the mixer. This mold includes a track ring for injection of material therein 124 to form a track ring ~~124~~ 125.

Please replace paragraph starting on page 23, at line 11, with the following rewritten paragraph:

The rovings which line the drum are drawn through the resin bath and applied to the surface of the drum as a wide ribbon comprising thousand of tensioned fibres. The composite is applied by winding filament about the drum over the bonding layer to form a fibreglass matrix with high strength properties sufficient to withstand normal operating loads applied during mixing and transporting concrete. The windings overlap until the required thickness is reached. The surface of the drum is covered with wet resin and small irregularities which need to be addressed to provide the external finish. As a result of this construction, the spiral mixing blades inside the drum are solid with high bending and shear resistance during mixing operations. The inner elastomeric surface is highly resistant to abrasion by concrete yet it is softer and lighter than the steel equivalent. The higher resistance to abrasion is facilitated by the natural elastic deformation of the elastomer which absorbs the kinetic energy of the concrete particles without gouging of the surface material. In addition, due to the property of the inner surface which will preferably be polyurethane, the concrete will be mixed rather than slide at the boundary layer ensuring efficient mixing of the concrete throughout the mix and reduction of abrasion due to the smooth curves throughout the interior of the drum. In a further step, the structural layer is finished with smooth pigmented resin which is applied utilising a clamp similar to that used for completion of the resin layer. Figures 19k and l show a two step process for application of a gel coat. Shell 123 is larger than shell 108 to accommodate the additional layer of the windings. As shown in figures 19m and n drum 120 is adapted with a ~~stiffening~~ track ring 124 which distributes loads from trunion rollers incorporated on the vehicle on which the drum is to be mounted. The stages illustrated in figures 19 k and l allows application of a corporate livery or alternative indicia into the structure of the finished drum as previously described. To achieve this, shell parts 123a and

123b are printed with a selected livery and sprayed with a background gel coat. After gelation a light layer of reinforced composite is applied and allowed to set. The shells are prepared in advance of the operation of application of the fibreglass windings while the resin is still liquid whereupon the shells are clamped around the windings thereby extruding out any excess resin. The shell mold assembly is mounted vertically and a two part compound is injected into a track ring mold space. Figure 19m shows the orientation of the drum 120 during this step. Once the resin has gelled, the shell molds are removed and the discharge end overwind is trimmed and a polyurethane drip ring ~~125~~ 126 is bonded at the discharge end. The final step involves removal of the mold remaining inside the drum followed by closure of the mandrel hole and cosmetic finishing. The mandrel is removed and the hole fitted with a pipe connection. The drum is stood vertically as illustrated in figure 19o and acetone which dissolves the polystyrene is pumped out of the interior which is then cleaned and washed. The drum is then finished by removal of any resin flash. Figure 20f shows a cross sectional view of a completed blade 110 with mold 90 and mold shell 108 removed. The free end of the blade is enlarged relative to the blade thickness to contain the reinforcing tensile member within the elastomer and to protect the tensile fibres from abrasion as concrete is mixed.

Please replace paragraph starting on page 26, at line 9, with the following rewritten paragraph:

The drum also comprises a track ring, which transmits the vessel loading to the support rollers and is constructed from fibre reinforced plastic formed integral with the structural shell of the vessel. It is anticipated that the plastics drum will outlast its steel equivalent under the same working conditions by more than 10 years. The wall strength will be in the order of 600~~MPa~~ Mpa at a thickness of approximately 8mm comprising approximately 2-8mm polyurethane and 2-8mm fiberglass winding. According to one embodiment, the elastomeric layers may be of contrasting colours to enable detection of wear spots.